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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-----------------|-------------|----------------------|---------------------|------------------|
| 09/902,243 | 07/10/2001 | Jac-Phil Boo | SAM-0219 | 8274 |

7590 06/19/2002
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EXAMINER

PHAM, LONG

| ART UNIT | PAPER NUMBER |
|----------|--------------|
|----------|--------------|

2823

DATE MAILED: 06/19/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/902,243

Applicant(s)

BOO ET AL.

Examiner

Long Pham

Art Unit

2823

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-9 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-9 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☒ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) ____.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Drawings

1. Figures 1A-1B and 2A-2D should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.
2. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(4) because reference character "5" has been used to designate both the bottom gate and the top gate in figure 1B. A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:
The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.
4. Claim 1 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.
In claim 1, lines 10-13, it is unclear how the second insulating layer is removed to expose the conductive layer if the conductive layer is already exposed when the first insulating layer is removed. It appears that the second insulating layer is selectively removed until the surface of the second insulating layer and the surface of the conductive layer are coplanar.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 1, 2, 3, 4, 5, 6, 7, 8, and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over the applicant's admitted prior art (AAPA) of this application in view of Nakamura et al. (US '225).

AAPA teaches a method of fabricating a non-volatile memory device having a tunnel insulating layer 22, comprising (see figures 1A-1B and 2A-2D and Description of the Related Art on pages 1-5 of this application): sequentially depositing said insulating layer, a conductive layer 23, and a first insulating layer 24 over a semiconductor substrate 21, said tunnel insulating layer including at least two portions of different thicknesses wherein said conductive layer serves a floating gate in a transistor device formed as part of a memory cell in the memory device; selectively etching the resultant structure to a given depth to form trenches; depositing a second insulating layer 25 over said structure including said trenches; selectively removing said second insulating layer so as to form element isolation regions composed of trenches filled with said second insulating layer; and removing said first insulating layer to expose the conductive layer.

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AAPA fails to teach that the second insulating layer is selectively removed by chemical mechanical polishing process using the conductive layer as an etching stop layer as recited in present claim 1.

Nakamura teaches that a second insulating layer 14 that fills the trenches 13 is selectively removed using the floating or conductive layer 16a as an etching stop layer. See figures 5A-5H and col. 1, line 5 to col. 8, line 65.

It would have been obvious to ***one of ordinary skill in the art of making semiconductor devices*** to selectively remove the second insulating layer using the conductive layer as an etching stop layer in the method of AAPA because in doing so shorting is prevented. See col. 6, lines 30-35.

Nakamura teaches that the second insulating layer is removed by wet or dry etching but fails to teach the removal is done by chemical mechanical polishing as recited in present claim 1.

However, it is well-known to ***one of ordinary skill in the art of making semiconductor devices*** that trench-filling insulator is removed by chemical mechanical polishing.

With respect to claim 9, it would have been obvious to ***one of ordinary skill in the art of making semiconductor devices*** to determine the workable or optimal range for the selectivity of CMP process through routine experimentation and optimization to obtain optimal or desired device performance because the selectivity is a result-effective variable and there is no evidence indicating that the thickness for the selectivity is critical and it has been held that it is not inventive to discover the optimum or workable ranges of a result-effective variable within given prior art conditions by routine experimentation. See MPEP 2144.05.

AAPA teaches that the conductive layer has a thickness but fails to teach the range for the thickness as recited in present claim 3.

However, it would have been obvious to *one of ordinary skill in the art of making semiconductor devices* to determine the workable or optimal range for the thickness for the conductive layer through routine experimentation and optimization to obtain optimal or desired device performance because the thickness for the conductive layer is a result-effective variable and there is no evidence indicating that the thickness for the conductive layer is critical and it has been held that it is not inventive to discover the optimum or workable ranges of a result-effective variable within given prior art conditions by routine experimentation. See MPEP 2144.05.

AAPA fails to teach that the first insulating layer is made of silicon nitride (SiN) as recited in present claim 4.

However, it is well-known to *one of ordinary skill in the art of making semiconductor devices* that silicon nitride is used as insulating material.

AAPA teaches that the first insulating layer has a thickness but fails to teach the range for the thickness as recited in present claim 5.

However, it would have been obvious to *one of ordinary skill in the art of making semiconductor devices* to determine the workable or optimal range for the thickness for the insulating layer through routine experimentation and optimization to obtain optimal or desired device performance because the thickness for the conductive layer is a result-effective variable and there is no evidence indicating that the thickness for the conductive layer is critical and it has been held that it is not inventive to discover the optimum or workable ranges of a result-effective variable within given prior art conditions by routine experimentation. See MPEP 2144.05.

With respect to present claim 6, AAPA further teaches that the second insulating layer is selectively etched through photolithography, the first and second insulating layers are flattened through a CMP process, and the

flattened first insulating layer is selectively removed but fails to teach the removal of the flattened insulating layer is done by photolithography as recited in present claim 6.

However, it is well-known to *one of ordinary skill in the art of making semiconductor devices* that photolithography is used to remove insulating material.

AAPA fails to teach that the second insulating layer for filling the trench isolation is made HDP as recited in present claim 8.

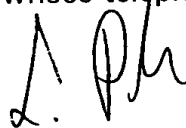
However, it is well-known to *one of ordinary skill in the art of making semiconductor devices* that HDP is used in filling trench isolation.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Long Pham whose telephone number is 703-308-1092. The examiner can normally be reached on M-F, 8:30AM-5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on 703-308-4918. The fax phone numbers for the organization where this application or proceeding is assigned are 703-746-4082 for regular communications and 703-746-4082 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.



Long Pham
Primary Examiner
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L. P.

June 12, 2002